

Nutritional considerations for dietitians

Vitamin D

A more sustainable diet does not necessarily have to exclude red meat or dairy altogether – therefore meat and dairy nutrient intakes need not be compromised.

This information sheet provides some additional information on nutritional considerations which dietitians may take into account. References and information sources are available as a separate download from www.bda.uk.com/onebluedot.

Vitamin D is essential for bone development and strength especially during peak bone mass accretion (from foetal life to our mid-20's).¹ Vitamin D is also essential for dental and immune health, steroid hormone production, muscle function, regulation and absorption of calcium and has been associated with reduced falls in the elderly as well as cardiovascular, autoimmune and cancer risk.^{2,3}

Recommended intakes

	Recommend daily intakes Vit D mcg ⁴	Who needs to take vitamin D supplements? ⁴
All age groups	10	<ul style="list-style-type: none">• Under 5's.• Individuals with limited outdoor exposure e.g. institutionalised individuals and the elderly.• Dark skinned individuals (natural melanin in the skin blocks vitamin D production. Especially South Asian women in the UK.• Those who cover up their skin.• Most of the population during the winter months.

Sunlight exposure between March and September is our primary source of vitamin D. Food sources become more important during the months between October and March.

Intakes

Dietary sources of vitamin D are scarce.^{2,5-7} Oil rich fish, eggs and cod liver oil, which are not consumed in large amounts, are naturally rich in vitamin D whilst some margarines and a handful



of breakfast cereals are fortified.⁸ Meat and liver provide very small quantities. Despite a common misconception, and unlike the US and some European countries, dairy is not fortified with vitamin D in the UK and therefore does not contribute to overall intakes.

Exposure of the skin to sunlight between the months of April and September in the UK is the main source of vitamin D and the government recommends that a daily 10mcg supplement should be *considered* by all especially during the months of October through to March. Additionally, for 'at risk' groups (under 5's, those with limited outdoor access, dark skinned individuals and those who cover up their skin) the government states that a 10mcg daily supplement should be taken throughout the year.^{4,5}

Vitamin D status is assessed by measuring serum 25-hydroxy vitamin D (25(OH)D) levels and values below 25nmol/L is indicative of deficiency. Vitamin D experts suggest that levels below 50nmol/L should be used as indicative of low status as vitamin D has now been found to be critical for many physiological processes beyond bone and dental health.^{2,6}

Assessment of the UK population has identified a significant proportion of the population to be deficient (<25nmol/L 25(OH)D) especially during the winter months: 26% of teenagers (39% teenage girls), 17% of 19-64 year olds.⁹ Additionally, over half of South Asian women in the UK were identified as vitamin D deficient in the summer months whilst in winter over 80% were vitamin D deficient (<25nmol/L 25(OH)D). Caucasian women have a higher prevalence of sub-optimal status (<50nmol/L) especially in the winter months.¹⁰

Studies comparing vitamin D status between meat and vegetarian and / or vegans reflect lower intakes and status in vegans and vegetarians, however, vegans still maintain serum 25(OH)D levels above 50nmol/L. in winter and summer months.^{11,12}

There is a significant drive for vitamin D food fortification in many countries including the UK due to the prevalence of sub-optimal status and lack of dietary sources.^{6,7}

Vitamin D comes in two forms, cholecalciferol (D3) and ergocalciferol (D2). The former is naturally produced in the skin by the sun's rays and found in animal foods such as fish, eggs and red meat, whilst the latter is present in plant foods and has to be converted in the body to cholecalciferol. The debate continues with regard to the superiority between the two forms of vitamin D.^{7,13} The D2-D3 group from Surrey University is attempting to bring clarity to this point.¹³⁻¹⁵

The most recent randomised controlled study investigating vitamin D impact in UK Caucasian and South Asian women found vitamin D3 to be 50% more efficient at increasing 25(OH)D status compared to vitamin D2.¹⁶ The group acknowledged that although higher doses of D2 are required to produce a similar D3 on 25(OH)D status, it may be a more acceptable format for food and drink fortification as, unlike D3, it is suitable for vegetarians.¹⁴



Red meat although providing some vitamin D, its concentration is low at 0.2-0.8mcg per 70g serving. Additionally, unlike other countries like the US, UK dairy is not standardly fortified with vitamin D. Thus, reducing intakes of both meat and dairy will have little if any impact on vitamin D status or vitamin D related health outcomes.

The One Blue Dot 'Practical guide for dietitians: other source of vitamin D' sheet gives information on key plant sources bda.uk.com/onebluedot

References

1. Weaver C, Gordon C, Janz K *et al*. The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors: a systematic review and implementation recommendations. *Osteoporos Int*. 2016;27(4):1281-386.
2. Umar M, Sastry K, Chouchane A. Role of Vitamin D Beyond the Skeletal Function: A Review of the Molecular and Clinical Studies. *Int J Mol Sci*. 2018;19(6):E1618.
3. EFSA. EU Register on Nutrition and Health Claims [Internet]. 2016 [cited 9/14/2018]. Available from: http://ec.europa.eu/food/safety/labelling_nutrition/claims/register/public/?event=search
4. PHE. Government recommendations for energy and nutrients for males and females aged 1 – 18 years and 19+ years [Internet]. 2016 [cited Aug 2018]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/618167/government_dietary_recommendations.pdf
5. SACN vitamin D and health report [Internet]. 2016 [cited 9/25/2018]. Available from: <https://www.gov.uk/government/publications/sacn-vitamin-d-and-health-report>



6. Pilz S, März W, Cashman K *et al.* Rationale and Plan for Vitamin D Food Fortification: A Review and Guidance Paper. *Front Endocrinol (Lausanne)*. 2018;9:373.
7. Wilson L, Tripkovic L, Hart K *et al.* Vitamin D deficiency as a public health issue: using vitamin D2 or vitamin D3 in future fortification strategies. *Proc Nutr Soc*. 2017;76(3):392-9.
8. Forestfield Software Ltd. Diet Plan7. McCance & Widdowson 7th summary edition of the composition of foods plus the revised composition of food integrated data set (CoFids). Patent Diet Plan7. 2018.
9. PHE. Results of the National Diet and Nutrition Survey (NDNS) rolling programme for 2014 to 2015 and 2015 to 2016 [Internet]. 2018 [cited 5/11/2018]. Available from: <https://www.gov.uk/government/statistics/ndns-results-from-years-7-and-8-combined>
10. Darling A, Hart K, Macdonald H *et al.* Vitamin D deficiency in UK South Asian Women of childbearing age: a comparative longitudinal investigation with UK Caucasian women. *Osteoporos Int*. 2013;24(2):477-88.
11. Crowe F, Steur M, Allen N *et al.* Plasma concentrations of 25-hydroxyvitamin D in meat eaters, fish eaters, vegetarians and vegans: results from the EPIC-Oxford study. *Public Health Nutr*. 2011;14(2):340-6.
12. Elorinne A, Alfthan G, Erlund I *et al.* Food and Nutrient Intake and Nutritional Status of Finnish Vegans and Non-Vegetarians. *PLoS One*. 2016;11(2):10.
13. Toyn C, Darling A, Hart K. Winter Meeting, 5–6 December 2017, Diet, nutrition and the changing face of cancer survivorship: Effect of vitamin d2 supplementation on serum 25 hydroxy-vitamin D3 levels: a systematic review and meta-analysis. *Proc Nutr Soc*. 2018;77(OECE1):E12.
14. University of Surrey N&M. Ergocalciferol (D2) vs. Cholecalciferol (D3) Food Fortification: Comparative Efficiency in Raising 25(OH)D Status & Mechanisms of Action (D2-D3 Study) [Internet]. 2017 Available from: <https://gtr.ukri.org/projects?ref=BB%2FI006192%2F1>



15. Gibson P, Wilson L, Tripkovic L *et al.* Effectiveness of vitamin D fortification in raising serum 25-hydroxyvitamin D (25OHD) status in subjects with vitamin D deficiency (25OHD \leq 25nmol/l): further analysis of the D2-D3 study population. *Proc Nutr Soc.* 2018;77(OCE1):E14.

16. Tripkovic L, Wilson L, Hart K. Daily supplementation with 15 μ g vitamin D2 compared with vitamin D3 to increase wintertime 25-hydroxyvitamin D status in healthy South Asian and white European women: a 12-wk randomized, placebo-controlled food-fortification trial. *Am J Clin Nutr.* 2017;106(2):481-90.

